Nutrient TMDLs in Baltimore Harbor

Update

June 10, 2003

Baltimore Harbor Stakeholder Advisory Group

Nutrient TMDLs in Baltimore Harbor

Update

- Endpoints -- DO and Chla
- Model -- Calibration and Review Processes
- Proposed Scenarios
- Schedule/Timeline

Endpoints

- DO
  - Adapt CBP proposed Criteria
- Chla
  - Adapt CBP proposed narrative Criteria
  - Numerical Criteria: < 50 μg/L

DO Endpoint
Maryland Regulation

- Designated uses -- All estuarine portions of Back River and Baltimore Harbor are currently designated in the regulations as Use-I waters
- From COMAR 26.08.02.03-3: Criteria for Use-I Waters - Water Contact Recreastion and Protection of Aquatic Life.
- The dissolved oxygen concentration may not be less than 5 mg/L at any time.
- If the natural water quality of a stream segment is not consistent with the criteria established for the stream then:
  - The natural conditions do not constitute a violation of the water qulaity standards; and
  - The water quality to be maintained and achieved is not required to be substantially different from that which would occur naturally.

DO Endpoint

CBP proposed Designated uses that applied to Patapsco/Back River

- I: Migratory Fish Spawning and Nursery Designated Use
  - DO: 6 mg/L 7-days average (only tidal habitats with 0-0.5 ppt salinity)
    5 mg/L 1-day minimum
  - Application: 2/1 ~ 5/31

- II: Open-Water Fish and Shellfish Designated Use
  - DO: 5.5 mg/L 30-day mean (tidal habitats with 0-0.5 ppt salinity)
    5.0 mg/L 30-day mean (tidal habitats greater than 0.5 ppt salinity)
    4.0 mg/L 7-day mean
    3.0 mg/L instantaneous minimum
  - Application: Year round

DO Endpoint

CBP proposed Designated uses that applied to Patapsco/Back River(Cont')

- III: Deep Water Seasonal Fish and Shellfish Designated Use
  - DO: 3.0 mg/L 30-days mean
    2.3 mg/L 1-day mean
    1.7 mg/L instantaneous minimum
  - Application: 6/1 ~ 9/30

- IV: Deep Channel Seasonal Refuge Designated Use
  - DO: 1.0 mg/L instantaneous minimum
    Incidence of sustained, periodic anoxic conditions acceptable (narrative criteria applies only to the seasonal anoxic region from 7/1 ~ 8/31)(V)
  - Application: 6/1 ~ 9/30

Proposed DO Endpoint for Back River

- For period of 2/1 ~ 5/31
  - DO: 6 mg/L 7-days average (only tidal habitats with 0-0.5 ppt salinity)
    5 mg/L 1-day minimum
  - Migratory Fish Spawning and Nursery Designated Use

- For period of 6/1 ~ 1/31
  - DO: 5.5 mg/L 30-day mean (tidal habitats with 0-0.5 ppt salinity)
    5.0 mg/L 30-day mean (tidal habitats greater than 0.5 ppt salinity)
    4.0 mg/L 7-day mean
    3.0 mg/L instantaneous minimum
  - Open-Water Fish and Shellfish Designated Use

DO Endpoint
For Baltimore Harbor (Patapsco river)

- A combination of water column stratification, narrow and deep dredged shipping channels and direct hydrologic connections with deep waters in the adjacent mainstem Chesapeake Bay leads to delineation of a
  - I: Migratory Fish Spawning and Nursery Designated Use
  - II: Open-water designated use: extend from the surface to the upper pycnocline depth
  - III: Deep-water designated use: occupy the volume between the upper and lower pycnocline depths
  - IV: Deep-channel designated use: the volume from the lower pycnocline depth to the bottom
  - V: Seasonally anoxic region (July and August only), that region would be defined as the volume between the bottom and half the distance between the bottom and the lower pycnocline depth

DO Endpoint
Pycnocline Distribution

- The protocol for calculating the presence of a pycnocline can be found in CBP's Technical Support Document (TSD) Appendix D for conducting Use Attainability Analyses (UAAs) .
- Median Station Pycnocline Depths and Percent Occurrence: 1985-2000

Baltimore Harbor	Upper Depth	% Upper	Lower Depth	% Lower	Interpyc Depth
Summer (July-September)	6.5	90	11.5	59	3.0

Proposed DO Endpoint for Baltimore Harbor (Patapsco river)

	2/1 ~ 5/31	6/1 ~ 6/30	7/1 ~ 8/31	9/1 ~ 9/30	10/1 ~ 1/31
0 – 6.5 m	I	II	II	II	II
6.5 – 11.5 m	I	III	III	III	II
11.5 – ½(bottom-11.5) m	I	IV	IV	IV	II
½(bottom – 11.5) m	I	IV	V	IV	II

Chla Endpoint

- COMAR do not state criteria for Chlorophyll a
- Recommended Chesapeake Bay Chlorophyll a Narrative Criteria:
  - Concentrations of chlorophyll a in free-floating microscopic aquatic plants (algae) shall not exceed levels that result in ecologically undesirable consequences -- such as reduced water clarity, low dissolved oxygen, food supply imbalances, proliferation of species deemed potentially harmful to auqtic life or humans or aesthetically objectionable conditions - or otherwise render tidal waters unsuitable for designated uses.

Proposed Chla Endpoint

- MDE will be adapting proposed CBP narrative Chla criteria to be implemented by existing Chla guidelines.
- Existing Guidelines: < 50 μg/L.
- Eutrophication model will be used to check Chla levels when DO reaches attainment.
- Using Chla rolling monthly average for attainment comparison.

Models

- Hydrodynamic Model -- CH3D
- Water Quality Model -- CE-QUAL-ICM
- Sediment Flux Model

Water Quality Model Calibration

- Time Series
- Longitudinal Profiles
- Primary Production
- Sediment fluxes
- Nutrient Limitation
- Statistical Analysis
- Summary

Model Calibration Summary

- DO Calibrations look good everywhere.
- Chla calibrations are good in most place, except in Rock Creek and Stony Creek.
- Model Catches the trend and match data very well in most places.

Model Review Processes

- Internal MDE review -- In process
- CBP Modeling Subcommittee
- State Agency/Local Jurisdictions
- Stakeholders

Proposed Scenarios

- CBP Scenario 175 -- CBP proposed allocation
  - Baywide
    - N: 175 million pounds/year
    - P: 12.8 million pounds/year

Schedule/Timeline

- Model Review -- July
- Scenario Review -- August/September
- Report Review -- September/October